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The role of 1st tier suppliers in automobile product modularization: the search for a coherent strategy¹

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Abstract :

Modularization is a growing concept in auto industry. Architectural decisions had been many time studied from the car maker's point of view. This article addresses the question of supplier's strategy in the modular business. A prior publication (Fourcade Midler 2004) showed that supplier's involvement could take various forms, from light coordination to heavy investment in deep module redesign. This article will investigate how these different modular involvement profile could fit in general 1st Tier supplier's strategy.

It is based both on a general study of automotive suppliers industrial field and an interactive research that we have been pursuing in conjunction with one 1st Tier supplier since 2001.

The first part of the article assesses the development of modular ranges by 1st Tier Suppliers. In its first section, we examine how, in the company we studied from 1995 to 2003, the modules in question evolved from a local market opportunity to an issue of strategic importance for the business. In section 2, in line with the resource theory pattern, we show how the Sysmod success story is deeply connected to a dynamic capabilities creation process. In the third section, we extend our analysis to all players that have performed an important role in the emergence of automobile modules. We will show that three types of suppliers has been players in the modularity development : industrial service providers, automobile-product-centred suppliers and functional-component specialists. In 2003, only the last two types remain as important module players. Is it structural or conjonctural ? How modularity fit with the general strategic patterns of these three types ?

The second part will try to answer these questions. In the first section, we will review the principal approaches on theorizing the automotive suppliers' strategies. In the second section, returning to our earlier typology, we shall precise the four different modular involvement profiles in term of both value creation and resources invested. Then, we will assess the extent to which these different profiles fit with general strategic pattern for 1st Tier Suppliers and discuss the possible strategic dynamics of the actual module players.

The results of this analysis led us to the following principal conclusions. It explains the initial dynamics of the market, with some players quickly dropping out of the frame while two types of company whose general

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strategies are nevertheless very different have managed to survive. It shows the necessity of combining module redesign involvement profile while constructing learning externalities that can be redeployed on other project and on other OEM. It shows that companies of both types are capable of lasting the course, in accordance with two trajectories that link general strategies and module strategies in a coherent manner. It validates the relevance of theoretical models that emphasize the resource construction dynamic over more static strategic models.

Keywords : Automotive industry /Module/1st Tier supplier typology /Strategy / Value creation

Biographical notes :

Francois Fourcade is a researcher at the Polytechnic Management Research Center (Centre de Recherche en Gestion). He has a 10 years long previous operational experience in the auto industry. His research focus on innovation strategy in the auto industry supply chain.

Christophe Midler, is Research Director at the Polytechnique Management Research Center and Professor on innovation and project management. He is Doctor Honoris Causa at Umea University, Sweden. His research topics are product development, project and innovation management, in relation with organisational learning theory. He developed intensive collaborations with European car manufacturers on various questions : project function, concurrent engineering and structure of automobile firm, co-design with suppliers, managing collaborative projects in global alliances, research and predevelopment phase management. He also developed research with construction, electronics, chemistry, pharmaceuticals sectors on questions as contracts, project portfolios, platform management, human resources management in R&D. He published many articles and books on the domain.

Introduction

Although the idea of modular architecture is a long-established one in the world of electronics and information technology, it has only recently begun to make headway in automobile manufacturing, where the end product is physically and functionally far more integrated than, for example, a desktop computer. However, the industry craze for modularization that took off in the mid-90s was followed by a wave of disillusionment: manufacturers that had seen in this architectural innovation the opportunity for significant advances in performance in terms of both costs and functional performance were often disappointed by the poor margins generated by the products, while suppliers that saw modularity as a new El Dorado have often been rewarded with a spectacular increase in the workload and the costs involved in the creation of modular ranges.

It is against this background that our study of modularization in the automobile sector, undertaken in 2001, unfolds. The first stage of our study led us to two important findings [1] .

The first finding involves the importance of the role of the 1st Tier Suppliers in the development of modular automobile products. Most prior research has addressed the issue from the perspective of the manufacturer[2, 3]; and, while the final decision on the overall design of its product does lie with the latter, achieving significant advances in performance (in terms of both function and costs) largely depends on the way 1st Tier Suppliers propose, and are capable of addressing, this opportunity. Early experience forms the basis for subsequent expectations with regard to the new strategy and is a determining factor in later developments, which is why our research centred on the modular strategies adopted by 1st Tier Suppliers.

The second finding concerns the variety of levels and ways in which 1st Tier Suppliers are involved in modular strategies. Our analysis of various cases of modularization revealed a wide variety of approaches. We also found that only configurations that closely associated modularization with significant innovation around the perimeter could last the course in a "win-win" trajectory for both manufacturer and 1st Tier

Suppliers, and such configurations depend on a set of significant conditions being met in terms of resources allocated, the internal structure of the 1st Tier Suppliers, and its relationship with the manufacturer.

All this raises the question of how much weight modularization really has in the strategy of 1st Tier Suppliers. This is the objective that we address in this article in light of the interactive research that we have been pursuing in conjunction with one 1st Tier supplier since 2001.

This article is structured in two parts:

The first assesses the development of modular ranges by 1st Tier Suppliers. In its first section, we examine how, in the company we studied from 1995 to 2003, the modules in question evolved from a local market opportunity to an issue of strategic importance for the business. In section 2, we show how the Sysmod success story is deeply connected to a dynamic capabilities creation process. In the third section, we extend our analysis to all players that have performed an important role in the emergence of automobile modules. We will show that three types of suppliers have been players in the modularity development: industrial service providers, automobile-product-centred suppliers and functional-component specialists. In 2003, only the last two types remain as important module players. Is this diversity in players' profile structural or conjunctural? How does modularity fit with the general strategic patterns of these three types?

The second part will try to answer these questions. In the first section, we will review the principal approaches on theorizing the automotive suppliers' strategies. In the second section, returning to our earlier typology [1], we shall precise the four different modular involvement profiles in terms of both value creation and resources invested. Then, we will assess the extent to which these different profiles fit with general strategic patterns for 1st Tier Suppliers and discuss the possible strategic dynamics of the actual module players.

The results of this analysis led us to the following principal conclusions:

- It explains the initial dynamics of the market, with some players quickly dropping out of the frame while two types of company whose general strategies are nevertheless very different have managed to survive.
- It shows the necessity of combining module redesign while constructing learning externalities that can be redeployed on other projects and on other OEMs.
- It shows that companies of both types are capable of lasting the course, in accordance with two trajectories that link general strategies and module strategies in a coherent manner.
- It validates the relevance of theoretical models that emphasize the resource construction dynamic over more static strategic models.

Part one: the development of module offers by 1st Tier Suppliers

1. From market opportunity to strategic factor: the history of Sysmod's module division

- The 93-98 period: a minimum-cost approach in preparation for the emerging module market

The point of departure for Sysmod's adventure in the modularization of front faces for automobiles was in 1993, when the company recruited a trainee industrial designer. At the time, Sysmod² was producing such heat-exchange components as radiators, condensers, charge air coolers, oil coolers, and so on. Another branch of Sysmod made front lighting assemblies, while still another made hood latch mechanisms. In keeping with the traditional strategy of automobile 1st Tier Suppliers – which involves absorbing the ever-increasing outsourcing demands of the manufacturers – the trainee was given the job of thinking up a way of cleverly integrating all these elements with different functions (cooling, lighting, etc.) and of looking into the technological possibility of designing a central "support" piece upon which all Sysmod components

² Sysmod is a fake company name used for confidentiality reasons

from the same geographical perimeter might perhaps one day be fitted. It's important to note that, at the time, Sysmod was not a pioneer but rather a follower where this approach was concerned: one manufacturer was already making, via its longstanding equipment supplier, such subassemblies, called front-face modules. The challenge facing Sysmod, therefore, was to gain credibility not in functional know-how but in its ability to integrate, in a single vehicle, components that, for a large part, were not part of Sysmod's core business. This meant that the company needed to acquire fresh competence. After examining the issue, Sysmod began to present its work to manufacturers, which, little by little, began to consider Sysmod a credible partner, until Sysmod was contending, by 1996, for the first contracts for front-face modules on a full perimeter, including Sysmod components, certainly, but also others, such as bumper beams, painted cowls, and canisters for windshield and headlight washer fluid. A further difficulty was that these modules had to be made in "just-in-time" sequenced mode,³ meaning that a new skills set had to be acquired by Sysmod, whose core business was in components that, by their nature, had never presented the company with this particular logistical challenge, so here again fresh proficiency was needed. The company enlisted the help of consulting firms to draft and present its first tenders to manufacturers.

As more and more contracts went up for bid, Sysmod stepped up its research activity on this new market, and in 1997 two project managers were appointed, one with a background in sales from its lighting operation and the other from cooling, with a background in R&D. Their mission was to understand and expand the market. They were allocated a budget, and were later joined by a three-person design team whose job was to devise the modules. Late in 1997, one of Sysmod's lighting divisions was approached by a manufacturer with a question: "We have a space shortage in our factory; would you be willing to deliver a front-face module?" Sysmod's answer was yes. Shortly afterward, and for the same reasons, Sysmod won a further contract in a different country. These were small projects in terms of volume⁴, with Sysmod's input limited to assembly and logistics, but they gave a significant boost to the company's learning curve.

Until then, Sysmod's management had been content to merely observe as this store of competence gradually grew. The team in charge of modularization operated on the fringes of the company's core business and was supported financially by the operational unit in charge of developing sales of thermal exchangers.

- The 1998–2002 period: from theory to practice, the market puts Sysmod to the test

The leap that brought an end to this early phase in the history of Sysmod's front-face module operations came on 15 October 1998 with the awarding by a manufacturer (after several preliminary orders) of a contract for one million front faces per year, to be delivered to four different countries. On 21 October 1998 there followed a presentation to the president of the Sysmod group, and on 2 November 1998 a module division was created. Such a division was essential if the modular team was to gain any credibility within the Sysmod organization – at Sysmod, "division" means "separate account", and the economic realities behind the contract could therefore be quantified in detail now.

The next step was to create teams, acquire competence and tools, and so on. Pending the arrival of reinforcements, it was all the initial team members could do to hold things together. Support came in the form of a wave of long-term trainees⁵ with backgrounds in sourcing and industry. During what became a most rewarding period, the core Sysmod team was able to gain the credibility and time it needed to acquire further competence. It was with this first contract that Sysmod won the standing it needed to move up, in the estimation of another manufacturer, from a potential second-tier component supplier to the status of partner as part of a joint venture with an 1st Tier Suppliers specializing in injected components (structural and stylistic), in the process winning a second and then a third contract in the same year (1999). Three

³ Delivery in sequenced just-in-time mode requires that modules be delivered in the order in which vehicles travel down the assembly line. Manufacturers decide upon this order only an hour before the vehicles arrive on the line for assembly; this creates a certain tension all along the supply chain established by the module supplier.

⁴ Between 100 and 150 vehicles per day, compared to over 1,000 per day for high-volume projects.

⁵ Six to eight months.

years later in 2002, the three projects – launched one after the other – gave Sysmod a spot in the world ranking for front-face module supply. The company now had about 200 people deployed on modularization, one-third of whom were working on the design for a new front-face module.

At this point in the story, the management of Sysmod decided to take stock. The fact was that, although the evident commercial success of the venture had considerably outstripped initial expectations, the management of Sysmod expressed strong reservations about further development in this area of activity. There were several reasons for this view: one was the amount of money consumed by the new division, and then there was the fact that the division made no significant contribution to the expansion of Sysmod's component business; rather, it functioned as a mere outpost of the company's long-term core concern. These issues found concrete expression in the form of such recurrent questions as, "What shall we *do* with this area?" and, more to the point, "What happens if we close it down?" With each new contract that went up for tender, the doubts of Sysmod's management persisted. It was thanks to the astuteness and tenacity of its teams that the modular concept survived until, finally – powerless before the commercial success of this "intrapreneurial" division, which had always remained on the margins of its operations – strategic imperatives forced Sysmod to take a stand on the future of the undertaking.

The question now facing the company was this: Is this success contingent upon a perimeter/team/market, or is it in fact a new strategic paradigm? How was Sysmod management to make sense of it all?

2. The Sysmod story as a typical dynamic capabilities creation case

To support the idea that Sysmod involvement in Module was more than a market opportunity but a real strategic turn, we will analyse how the firm built strong competencies through a dynamic capability creation process, in line with the resource-based view [4, 5] [6]. As Samsung could grow from nothing to a 35% market share in the semi conductor business [7] building strong competencies through a dynamic capability creation, we will try to describe how Sysmod has come to build module supplier capabilities that permit to be a major player in the field, coming from component specialist background. The dynamic capabilities are defined by Eisenhardt and Martin [8] as "a set of specific and identifiable processes such as product development, strategic decision making and alliancing". Without making any claims to an exhaustive study, we can still group this competence into six subsets: logistical competence, R&D competence (products and projects), value creation models, knowledge of the client's operations, organizational challenges for the 1st Tier Suppliers, and reconfiguration challenge through the supply chain.

Logistical competence

In four years, Sysmod put together a production base of six advanced manufacturing facilities in six different countries, the smaller plants producing 150 front-face modules every day and the larger ones producing 2000 per day. Sysmod has now established itself as a credible 1st Tier Suppliers in the production of modules in sequenced just-in-time mode. This competence is not revolutionary in the automobile sector – 1st Tier Suppliers making large, highly-diversified components had faced the same problem before, and had duly created the competence they needed. It was new for Sysmod, however, as its core business products were delivered directly from inventory, with no need to acquire this new skill. In 1998, Sysmod lost out on more than one contract because it lacked this competence. One of the inputs provided by Sysmod's partner company in a contract won as a joint venture in 1998 was in fact the ability to work in just-in-time mode. Sysmod's front-face module division is now autonomous in this field, with an internally developed information system that has already attracted interest beyond the frontiers of the Sysmod group.

R&D competence

As it learned more about the development of modules, new job functions opened up for Sysmod – the job of module architect, for example, which had not previously figured in Sysmod's core competence. As the module architect is in charge of all components within the module perimeter, s/he needs to work hand in hand with the manufacturer in the architecture of the module.

As the front-face module division was responsible for designing the interfaces between the various components and for co-designing⁶ the interfaces between module and vehicle, it had to gain an understanding of, for example, what a vehicle chassis is and how it works, or a bumper beam, or painted cowl⁷. This new component competence has now been taken on board. In our opinion, it's important to note here that it was the "naiveté" of this Sysmod division that enabled it to come up with innovative ideas on components outside the traditional domain of Sysmod. It appears important, as explained by Brusoni & Prencipe [9] to extend the perimeter of knowledge beyond what is strictly necessary within the company's perimeter of production. Sysmod's teams are now able to propose an innovative re-segmenting of the product, offering new advantages in terms of technical performance.

New value creation models

In its development, the Front end module division had to formulate, settle and promote inside Sysmod as inside its customers new models for value creation on the modular scope, that renewed and often conflicted the two classical value drivers in the component business : systems optimization and standardization.

The systems orientation focus on functions, while the modules specialist must secure geographic rationalization without affecting (and preferably improving) functional optimization. One cannot exist without the other. But system approach has a longer history in industry than Modules, as within the component suppliers as within OEM. Then, owing to the way manufacturers select their module supplier or suppliers, this optimization is now managed in sequential fashion. Functions are optimized first and the architecture of module components second. In fact, when a module supplier wishes to create value by re-examining this or that technical choice made by the systems specialist, the latter will explain that it's already too late.

The added value provided by the module specialist, from the point of view of the 1st Tier Suppliers, lies in the optimization of each component's architecture. Manufacturers may also see modularization as a way to promote the standardization of vehicles [10]. Therefore, the 1st Tier Suppliers are likely to look unfavourably on the standardization of components imposed by the manufacturer. A classic case, which affects nearly all manufacturers, is that of hood latch mechanisms. Every manufacturer wants to optimize the cost of this component via the volume effect. Our observation on the ground has revealed situations where the cost of interfacing this standard component with the chassis is three times higher than the cost of the component itself. If we multiply this extra cost by one million units per year, we may well ask ourselves whether the gains achieved through standardization were worth the effort.

Knowledge of the client's operations

Here, the first task facing Sysmod was to re-cast its customer relationship structure, for manufacturers did not buy their front-face modules through the same channels used for the traditional functions of Sysmod. This task in turn entailed another type of learning. Let's take the front-face module as an example again. This module comprises an average of 30 individual components, from larger elements such as the bumper beam and the radiator to smaller parts such as warning lights and attachments. Most automobile manufacturers are organized according to a functional logic – the cooling-systems function has its own designer and its own buyer, shock absorbers their own designer and buyer, and so on. Not only this, but other elements of the manufacturer's organization are important, too. Take architects for instance: there are architects of the under-hood engine environment and architects for external elements. To our knowledge, even the manufacturers that are most advanced in matters of modularization have not modified their interface with the 1st Tier Suppliers – or, where they have, the changes are no more than superficial. The 1st Tier Suppliers therefore finds itself forced to act as coordinator for its client, a difficult role to play when you're not integrated into the manufacturer's organization. In practice, it means a lot of time spent on making decisions. For example, it took over two months for a manufacturer's manager in charge of liaison

⁶ A front-face module is created using the joint-development method defined by C. Midler (....).

⁷ These components are not part of Sysmod's product range.

with the module supplier to sign an agreement for a lock mechanism because there were so many decision-makers were involved. All in all, Sysmod's early experiments in module development gave it considerable insight into how its clients function.

Furthermore, as an illustration of the extent of contingency involved in module production, we can identify different client types using the "delegation of responsibility" variable. Sysmod has worked with manufacturers that relieve the 1st Tier Suppliers of all responsibility in the design of the module, seeing the module supplier merely as an assembler and logistician. At the other end of the scale, Sysmod has also worked with manufacturers which demand that their 1st Tier Suppliers take total responsibility for the design of the module, the choice of supplier, and so on.

Organizational challenges for the 1st Tier Suppliers

Over the years, 1st Tier Suppliers have shaped their organization to create an efficient interface with the manufacturer. Like the manufacturers, most 1st Tier Suppliers – Sysmod, for one – are organized in terms of functional product lines. We can therefore understand why, as happens with the clients, a division whose job is to optimize module architecture should also have to multiply internal channels of communication as required by the number of different functions resident on the developed module. In short, the team in charge of developing the modules on an internal basis encounters the same difficulties as those faced by the manufacturer. And as with the manufacturers, cross-cutting concepts find it hard to survive, either because they're drowned at birth by counter-concepts (systems, standardization, or economic optimization of the component to the detriment of the system for profit-centre reasons), or because, since they span various divisions, they fail to find an internal sponsor.

Reconfiguration challenge through the supply chain.

Sysmod's front-face module division learned the hard way how to appreciate the difficulties inherent in each component, but with regard to relationships with joint venture partners and Tier-2 suppliers, the thorniest issue of all was the war to secure a superior position on the value chain. On every occasion where the manufacturer has failed to clearly indicate who is in charge of whom, difficulties have emerged and have had a serious impact on product quality, with the resulting deterioration in the innovative content of the product limiting the financial gains from the contract⁸. The challenge here is to hold on to the privileged position of Tier-1 supplier. Even if many Tier-2 suppliers are doing very well, some Tier-1 suppliers for a conventional architecture are reluctant to be downgraded to a Tier-2 position by a module supplier. What this signifies in practice is internecine warfare among 1st Tier Suppliers, with reductions of sale prices and therefore of margins. During the project, there occur a succession of short-circuits caused, to a greater or lesser extent, by the manufacturer. Sysmod therefore sounded out its rivals and potential partners in an attempt to map the strategic positioning intentions of each one, and four years on, it has sealed a number of partnerships with regard to these modules⁹.

3. Leading 1st Tier Suppliers in automobile modularization

Let us now extend our analysis to the other suppliers that entered modularity. The automotive supplier sector in its previous structuration was already fiercely competitive when studied by Porter ([11],[12], and the players – and sysmod among them – firstly saw the emerging module market as a new differentiation niche for high advanced suppliers. But rapidly the surprise – and disillusion – was big, as a large variety of players succeeded to enter the business, creating very rapidly an exacerbated the degree of competition.

When characterizing the suppliers which involved in the module business, the research identified three types of 1st Tier Suppliers considering the offers provided to manufacturer.

⁸ As we will see, the contract's precarious profitability was, in our opinion, directly linked to the degree of innovation in the module that was developed. Without innovation, there could be little profitability.

⁹ Examples includes Expert Components, acquired by Venture/Peguform; Hella's joint venture with Behr to construct front faces, sometimes with the participation of Magna; Kansei's joint-venture with Calsonic to make front-face modules and cockpits; Denso and Magnetti-Marelli; and so on.

Industrial service providers

These 1st Tier Suppliers are module manufacturers in the most restrictive sense of the term, i.e. a physical grouping of components assembled and sold as a single product. In the early days of moduling, some manufacturers turned to this type of 1st Tier Suppliers, which won significant market share by making use of competence in just-in-time sequenced delivery that they had gained in producing large, diversified components such as seats and cowls. This arrangement suited the manufacturers perfectly as there was no need for them to modify their component purchasing policy: the industrial service providers bought the components where the manufacturers told them to buy, at the price set.

Automobile-product-centred 1st Tier Suppliers

These 1st Tier Suppliers are now leading players in the modules sector. Their backgrounds are in processing activities such as sheet metal and plastics. The 1st Tier Suppliers of this type that have not become trapped in a single area of materials-processing competence have extended their skills to more technically-demanding products such as structural vehicle parts and styling elements. Components of this complexity require these 1st Tier Suppliers to understand the general constraints affecting the automobile product (limitations regarding safety and style). Not only were these components complex, they were also bulky, which forced 1st Tier Suppliers to develop the skills necessary to produce according to just-in-time sequenced requirements.

Historically, the size of these components and the diversity imposed by the number of colours involved (sometimes more than 40) has forced these 1st Tier Suppliers, for stock-rotation reasons, to set up next door to the manufacturers' assembly plants. We should note that, to preserve the ability to deliver to several manufacturers from the same factory, these 1st Tier Suppliers have refused, whenever possible, to install heavy equipment (injection presses, hot-stamp presses, and cutting gear) on the premises of the manufacturers; instead, they've worked with the manufacturers to create supplier parks where they could perform operations, such as sequencing of painted components using local stock, at a low capital cost. The same phenomenon can be observed in the production of fuel tanks and vehicle seating. Process specialists therefore contributed to the creation of supplier parks long before the emergence of the modules era. Once they had located to these supplier parks, these process specialists tried to diversify into as many tasks as possible in their efforts to improve returns on their investment in proximity production facilities. They therefore sought to install as many small components as possible (fog-lamps, ultrasound sensors, wiring, clips, and screws) in the parts they supply. Their next move was inspection services for quality of appearance, or for connectors and wiring. Their status as assembly-plant insiders brought them closer to their clients, and therefore they were better able to anticipate their clients' needs. Their strategy went beyond component sales to encompass component-related services: assembly (there are some 25 components installed in a painted cowl alone), just-in-time delivery, quality control, management and administration of defects for which Tier-2 suppliers are responsible, and more. These extremely complex products were really modules before the term even existed. With their experience in assembly operations and their proximity to the assembly lines, these 1st Tier Suppliers began to understand how designs could be changed to make assembly easier, to manage stoppages better, and to appreciate how details of clearance and flushing could improve visual appearance. And so, little by little, they edged toward possession of a key area of competence in the module market: that of architect.

These 1st Tier Suppliers, which we designate here as "product-centred", offered their clients more than industrial service providers could, and based their strategic positioning on their ability to rise to the challenges posed by the production of technically difficult parts where appearance is of the essence. By combining industrial with technical aspects, these 1st Tier Suppliers effectively became module suppliers.

Functional and component specialists

This is the third type of 1st Tier Suppliers on the module market. These 1st Tier Suppliers possess competence in certain components deemed critical within the perimeter of the module in question. Component specialists (of which Sysmod is one) are 1st Tier Suppliers that owe their place on the module market to their ability to provide a significant proportion of the components comprised in the module from

their own product range. This proportion can, in some cases, be over 80% in terms of the value of the components. It's their in-depth competence in modular components, therefore, that allows them to set their sights on developing the product architecture.

The overall strategy of component specialists has been to concentrate the means of production to a maximum and to standardize products as much as possible, with only the installation interfaces of the components being custom-built. A single product may run to a production level of 11 million units per year, and this makes economies of scale possible. But while these savings have made the economic model followed by these 1st Tier Suppliers a lasting one, competition has grown tougher. For the last 10 years now, component specialist 1st Tier Suppliers have sought a way out of the mutually destructive scenario of a price war by looking to technological innovation as a way of ensuring cost reduction without putting a squeeze on margins. This strategy has allowed them to survive, but other strategic levers must now be found. Benefiting from the "de-verticalization" policies of manufacturers, one strategy has been to look beyond components to the functional perimeter, designing and offering what we now call systems; for instance, moving from A/C condensers to the full loop, including compressor, tubing, and electronics.

Such a situation raises many questions concerning strategic issues of Supplier involvement in modularization: what is the rationale behind such common interest from supplier with so different businesses ? In 2003, when analysing OEM suppliers' panel for module request for quotation, the remaining players are only the product-centred and component-function specialists. Has the modular business now reached a mature situation, based on stable trends or can we forecast new evolutions ? If not, how can we characterize the strategic rationalities of the remaining players ? Part two of this article will try to answer these questions.

Part two: module involvement and the general strategy of 1st Tier Suppliers

1. Strategic patterns for 1st Tier Suppliers: learning from history and literature

The 1990s has seen deep transformations in suppliers-OEM relations, from classical market to more integrated partnership. The literature had largely developed the strategic rationalities behind such transformations from the OEM point of view[13]. They lie in enhancement in product development and innovation performances (Clark and Fujimoto, 1987, [14]Midler 1994[15, 16], Garel Midler 1997, Segrestin, 2003)[17], transaction cost reductions (Williamson, 1975[Williamson, 1975 #155], Baudry, 1991), share of sunk investments (Teece, 1986) and principal-agent control (Baudry, 1991).

The supplier's side of strategy has been more recently covered (Lamming, 1993[18], Kesseler, 1996 [19] , Donada 1997[20], Garel, Midler 1998 [16], Lenfle Midler, 2001[21], Lemasson Weil 2002[22]), as the supplier firms had to react to their clients' deep and rapid strategic moves: why and to what point to involve in such new partnership relations, which were related to far heavier investments and strategic choices ? We shall resume the argumentation in the following points.

- Considering the ongoing dynamics of the Auto industry, confronted more and more to intensive innovation context, there are no more doubts about partnership efficiency to generate value. In that context, resource theory (Kogut 1988, Hamel 1991) will suggest the supplier to be involved in these risky relations, because of the valuable learning that will come out of it.
- The theory on power-dependance in vertical trade relationship (Pfeffer and Salancik, 1978, Buchanan, 1992) demonstrate the importance of initial conditions of relationship to the final share of outcomes between the players.
- This leads to a classical strategic question that all automobile 1st Tier Suppliers must grapple with: Is it better to respond to the demands of the client or to anticipate them? This is a classic question in the strategic management debate [23]: the problem lies in deciding whether the company should first seek to innovate by offering new solutions ("innovation orientation") or whether its first move should be to identify the needs of the client and develop its products accordingly ("customer orientation"). Customer orientation, as demonstrated by Christensen and Bower [24], can entail the loss of larger clients; the adoption of an innovation-oriented strategy as

a complement to customer orientation therefore becomes vital (Kesseler 98)[25]. We could call this the customer / innovation orientation dilemma.

Lamming [18] propose a interesting answer the innovation/customer orientation dilemma for 1st tier suppliers. He suggests that two strategies are viable.

- The "loyal partner" accept the dominance of the client and remains faithful to its customer orientation strategy. He develops flexibility in the face of the diversified demands of the automobile manufacturers. It strives to answer yes to technical challenges, even if it means taking risks. Its internal organization brings it into close proximity with its clients, with the resulting intimacy raising a strong barrier against the entry of competitors that do not have this understanding of the client. Similarly, on the industrial plane, its attempts to forge an ever stronger relationship with its clients leads it to locate near as many manufacturer plants as possible and to offer as many services as possible from its installed base.
- On the contrary the "key partner" that seeks to influence the technology decisions of the client by occupying a key position. He also builds strategic barriers against incursions by rival companies, but on a different level: it's the technical excellence of its components and its extensive capacity for innovation – coupled with a strong patent-filing policy – that make this kind of 1st Tier Suppliers indispensable in the eyes of its manufacturer client.

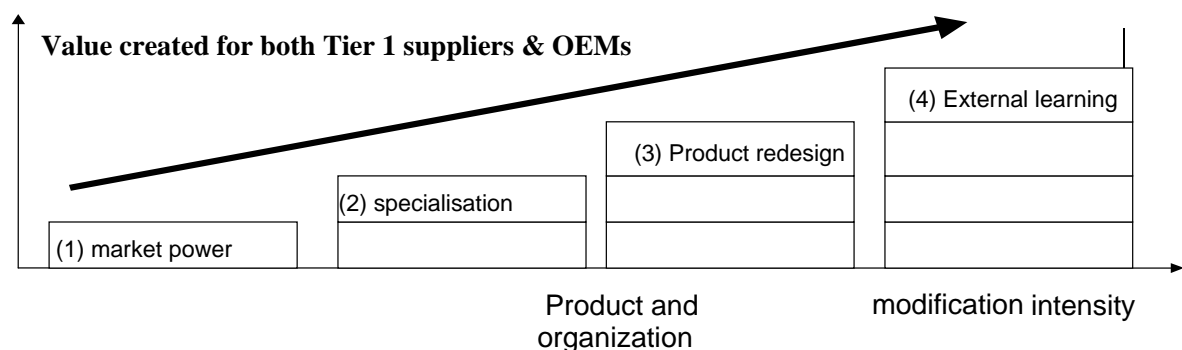
Donada [20] describes the success factors and the traps awaiting these two strategies. The key common trap is to invest too much in investments that the supplier cannot redeploy, the “loyal partner” because he is trapped in the singularities of its customer ; the “key partner” because he cannot impose its customers the protected breakthrough he developed.

How do modular decisions fit in these strategic perspectives ?

2. A typology of modular involvement profiles

Before addressing this question, a prior result of our research was to demonstrate that supplier’s modular involvement needed to be more precisely characterized than a go/no go decision. Fourcade Midler (2004) [1] formalized four different modular involvement profiles for 1st Tier Suppliers, considering the value targets addressed as the conditions for success associated with each one.

Figure 1: A typology of modular involvement profiles for first-tier suppliers
(source : Fourcade, Midler 2004)



The market power profile (1) is a defensive approach whereby the company contends for contracts solely to lock in its position as a privileged partner of the manufacturer and to increase market share for the components incorporated into the module.

The specialization profile (2) is based on the fact that the new component perimeter opened up by the modular concept can generate economic gains through the optimization of assembly and logistical metrics,

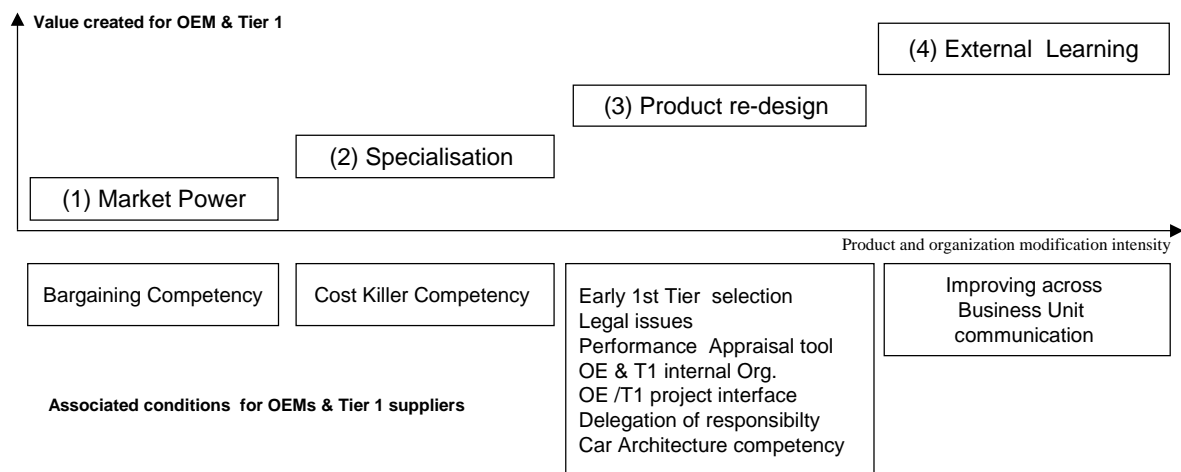
an optimization which the 1st Tier Suppliers is more capable of carrying out than the manufacturer, which is less specialized on a restricted perimeter. At no point is the product itself modified.

In the product redesign profile (3), the 1st Tier Suppliers generate value by a deep redesign of the inside of the module, from a simple aggregation of component functional requirements and inside architecture given by OEM.

The fourth modular strategy, external learning, has its rationale in what the company can learn and transfer elsewhere within its other offers provided: transform components to develop their contribution to future modular products, anticipate break through on technologies that favour module innovations.

These profiles are tightly related to success conditions, in terms of the nature of the resources mobilized, internal processes, and contacts with manufacturing clients. We have shown [Fourcade-Midler, 2004 #69] that the disappointments encountered in recent moduling projects derived, in very general terms, from a mismatch between the chosen profile for the creation of value and the conditions intrinsic to the situation. To ensure that these conditions are firmly in place, we need to examine the wider strategy pursued by the company.

Figure 2: The setting up conditions associated to modular involvement profile
(source : Fourcade, Midler 2004)



We see that these associated conditions can be expressed in the strategy vocabulary in term of resources, customer orientation, and internal organization.

3. Discussing the value creation/profit share dilemma of modular involvement profiles

We can now characterise the different modular involvement profile in our strategic pattern that crosses the global value performance and the customer trap risk

Value performance vs Non deployability - Trap Risk	-	+
-	(1), (2)	(4)
+		(3)

First and second profiles create poor value and low risk. They can typically contribute to a “loyal partner” supplier type. But these profile are not sustainable on the long term, for the value performance is too feeble to meet customer as suppliers need for profitability.

Profile (3) is interesting for OEM but problematic for the supplier. The investment is particularly heavy for them, and its transferability is problematic for two reasons. First, the risk is high that value of a global redesign of the module will be captured by the OEM in its following products, with poor effects on investment profitability for supplier. Second, the possibility to transfer the solution to other range of product or customer is also feeble. The dynamic of auto architectures are rather unpredictable: on the contrary of computer domain where platforms are no more proprietary, where the industry is driven by the self fulfilled prevision of Moore’s Law and a permanent bargaining of stabilizing standards by the platform leaders (Gawer 2000) [26]. In the auto industry on the contrary, architectural solutions are tightly product contingent (it is an integer product” in Fujimoto’s terms [27] because the advantages of standardisation is clearly counterbalance by a heavy disadvantage in terms of global product performances, differentiation and innovation tracks (see Fourcade Midler 2004)[1]. Therefore, the interfaces and design rules [28] are not well stabilised, and consequently, as pointed out by Chesbrough & Kusunoni, (2001, # 36)[29] this is a typical high customer trap risk situation for the 1st Tier Supplier implementing a “loyal partner” strategy.

Profile (4) answers the risk identified in profile (3). External learning is the way 1st Tier suppliers can avoid the product/customer contingency trap by embedding module design investment in supplier’s private “undeconstructable” resources or competencies that can be redeploy and valued elsewhere. Using external learning as a springboard into the modules sector is tantamount to saying, "The value of the module is outside the module." 1st Tier Suppliers pursuing this strategy will seek to establish a learning node that can quickly incubate new knowledge, which can be mobilized elsewhere in the 1st Tier Suppliers's supply portfolio to create new components as solutions to the problems detected during the course of work on the modules. For example, aluminium radiators absorb hardly any shock in a frontal collision. The 1st Tier Suppliers supplying the radiators might discover this drawback during its work on the module, and devise a radiator whose job is not only to cool the engine but also to act as a shock absorber in the event of collision. This is one example of positive external learning

Such a result put in question the Lamming dual strategy model, when implemented on the modular domain. On one side, pure “loyal partner” strategy appears non viable on the long term, (poor value creation or too risky when the industry is in high innovative period as now). Pure stand alone “key partner” strategy seems also non realist, as external learning is deeply dependant of supplier’s involvement in product/customer contingent module redesign. Profile (4) is an extension of profile (3). Hybridation of strategies appears as a necessity to maintain the modularity trend alive in auto industry.

4. Why do suppliers go, quit or remain modular ?

Lets us now interpret the ongoing situation of 1st Tier Suppliers on the automobile module market with the help of these strategic reasoning. We saw in part one that three different types of 1st tier Suppliers played an active role in auto module business development: industrial service providers, auto-product centred suppliers and component-function centred suppliers.

4.1. The short rush of industrial service providers in auto module business.

The dynamics of industrial service provider involvement in the module business fit well with our strategic pattern. By its nature, in close proximity to its clients – often offering its services within their actual plants -

the industrial service provider (Expert Component, Katoen Natie, TNT) is therefore a typical “loyal partner” oriented supplier.

Therefore, industrial service provider appeared naturally as early players in the module business, implementing involvement profile (1) and (2). Since they have no concerns about preserving their share of the components market beyond the structural support of their modules, they are not in conflict with the buying policy of manufacturers that sometimes want to choose such-and-such a panel supplier. Competence in assembly and just in time delivery are valuable resources for cost killing actions in profile (2).

When deeper involvement in redesigning the product is considered, as in profile (3) and (4), the strategy is simply not an option for industrial service provider, because the required competencies are so far removed from their core activity. The only way to maintain in the module picture is to seek an alliance, as illustrated by the case of VEAS.

4.2. The automobile-product-centred suppliers strategic track: from loyal to key partner looking for module externalities

As for the industrial service providers, profile (1) and (2) were natural strategic move for product centred suppliers, already active in Supplier Parks. Their position in the value chain is already strong, therefore, and using architectural and integratory competence they can consolidate this position, so the challenge facing automobile-product-centred 1st Tier Suppliers is to preserve their position as the first choice of the manufacturer in a scenario of increasing delegation of responsibilities. They have developed “cost killing” skills as well as competence in assembly, often adapted from existing technologies devised with the purpose of assembling accessories on parts such as cowls or door panels, and they have strengthened their loyal partner strategy by offering more modularization services, since to be there when they’re needed on the new module market obviously serves their “loyal partner” general strategy line.

In implementing deep module redesign, big product-centred suppliers as Plastic Omnium, Faurecia could build on its competencies in the domain of general architecture of big subsystems, structural engineering and styling. But they rapidly encountered two types of problems. First, they prolonged their loyal partner strategy to a risky trap situation where they cannot value the dedicated module redesign investment through redeployment. Second, redesigning a module presupposes a sufficient level of competence across a significant range of components if these are to be redesigned right back to their shape, the way they connect to other components, and so forth. If it is to be successfully adopted by automobile-product-centred 1st Tier Suppliers, to go beyond a simple reconfiguration of components on the support piece, they will need to acquire an adequate knowledge of the components and systems carried by the module. Acquiring this knowledge may seem difficult on the internal level, with mergers of acquisition being the necessary solution.¹⁰

To come out of the module trap, the automobile-product-centred 1st Tier Suppliers may search for externality effect. They can migrate from “loyal” to “key” partners by developing product centred competences as systems for designing styling elements, or service providers for global solution on functional features tightly connected to their architectural knowledge. For example a 1st Tier Suppliers that has traditionally produced painted cowls may move into pedestrian- or obstacle-detection systems designed to safeguard the vehicle against possible collision, or into.

4.3. The component-functional centred suppliers’ metamorphosis to module solution providers

The component and systems-centred 1st Tier Suppliers (for example Valeo, Siemens, Sysmod, JV Hella & Behr, JV Kansei & Calsonic), meanwhile, seeks to prosper via the excellence of its components and its ability to impose standards (ascending strategy). First, it files patent applications in its attempts to make

¹⁰ As illustrated by the recent joint venture of Plastic Omnium and Hella Behr.

itself a key player, and then it offers its "protected" technology to the manufacturer. The component and systems-centred 1st Tier Suppliers, therefore, is by nature a key partner.

Profile involvement (1) was a defensive first move for functional and component specialists. They saw opportunity in modularization, at the outset, if it allows them to sell more components or at least to consolidate the market share they have already secured [Fourcade-Midler, 2004 #69] pp 13. The challenge of maintaining market power and therefore their Tier-1 status is an issue with greater importance for them that view modularization as a threat to be pushed further back along the supply chain.

When accepting the module involvement challenge along with profile (1), (2) functional and component specialists rapidly encountered coherence problem with their initial key partner strategic position .

- The credibility of functional and component specialists was based on their knowledge of components, but while the provision of modular products remained no more than a question of subcontracting assembly and logistics, it was difficult to turn this knowledge into value.

- In profile (1) and (2), module specifications leave not much if any room for modifications to components, nor do they allow the 1st Tier Suppliers to protect its share of the components market, as contending for modular contracts has forced them to develop new skill sets that are on the fringes of the core business of the function- and component-centred 1st Tier Suppliers. With so much money being consumed in the learning process and so few returns from this learning in terms of revenue, each new modular contract forced the strategic management, focused as it was on the quality of its components and systems, to reconsider its presence on the emerging module market.

- Involvement in specialisation efforts was an opportunity to extend their product perimeter – but the manufacturers had their doubts. These 1st Tier Suppliers are strangers to the supplier parks; they have no previous experience in just-in-time delivery, no in-built knowledge of structural parts or of the processes for manufacturing them, and no tools for producing them. Furthermore, in open opposition to the standard product concept, owing not least to the "style" aspects of modules, the module market is one in which customization plays an ever-larger role, requiring close co-operation with the client and operating at extremely advanced levels of vehicle design. Functional and component specialists have no such relationship with their clients. Initially, with the existence of these factors, Sysmod found itself facing a very delicate problem: a proposal that required it to align with the product-centred 1st Tier Suppliers and effectively occupy a Tier-2 position, offering competence in components for module construction. Sysmod rejected the offer and had to employ considerable powers of persuasion to partially counter a growing trend in order to secure a position among the automobile-product-centred 1st Tier Suppliers, often in the form of contingent partnerships.

On the other hand, when they succeeded in these challenges to meet profile (1) and (2) successfully, when the strategic ambition had been refocus at the larger level of module solution key partner, redesign involvement and learning externalities appears as coherent and synergic profiles. On one side, they can value their competency on many key components to propose original value adding design for the module ; on the other side, their knowledge of the large modular environment can be exploited in monitoring the road maps for the evolutions of the component portfolio. When playing this strategy, the difficulty to ensure that their organization supports this kind of information transfer and is not blocked by the "not invented here" syndrome.

Conclusion: Towards new strategic coherence for module suppliers involvement in automotive supply chain.

First initiatives from suppliers on the module business were not based on a clear vision of the answer to the "why?" question. Many quite different players entered the game with a "why not?" or "what if not?" motivation. After a while, the strategic issues of the question could not be answered :Is modular solution revealing itself compatible with strategic intends of such diversified business configuration such as industrial service providers, product-centred suppliers and component-function specialists ?

To answer this question, we first saw that, for suppliers, going to modular business could have a quite significant different meaning that we characterized as four different modular involvement profiles.

Then, we showed that the first two profiles (focussed on customer relation to maintain market power and cost reduction only on the industrial service perimeter) could easily combine with various 1st Tier suppliers strategic patterns. This could explain that quite different suppliers as industrial service providers, product-centred supplier and component specialists competed in the new module market.

Unfortunately, these two profiles did not generate enough value in the global value chain to maintain the incentives for module architectural trend. Some suppliers were financially damaged as a result of this learning, and the success of the notion within the manufacturer lost its intensity in the beginning of 2000.

Going deeper in module redesign appeared then as a condition to maintain and develop a sustainable value creation model through the module concept, and thus develop the module market. At this point, only product-centred supplier and component specialists could address the module redesign challenges, each with its own specifics assets: the architectural, structural and style competencies on one side ; the precise knowledge of components and functions within the module on the other. As for the industrial service providers, they could keep up in the market only as associated in JV with the other categories.

For the two key remaining players, an involvement such as in the third modular strategy (product-redesign) affect the coherence of the existing strategic pattern. For the product-centred supplier, once driven by a loyal partner strategy, the investment in developing new important competencies, generates a high risk of non deployability that did not fit the flexibility imperative of such a strategic pattern. For the component centred supplier, traditionally associated with a more autonomous key partner strategy, they had to accept the challenges of enlarging their scope to new architectural competencies and developing the product-process intimacy with their customers.

This call for a renewed coherent and viable strategic model, that associate heavy involvement in module solution providing with external learning capacities that can diminish the non deployability trap risk. For component centred supplier, the value is to be find in linking component portfolio roadmaps to global valuable module solutions. For product-centred supplier, externalities quest leads to value competencies associate with their global view of module as style or pedestrian crash solution provider for example. We shall call it the dual module strategy, preferring the “duality” notion to “hybridation”.

On this basis appears the possibility of maintaining a quite diversified offer in the general category of global module solution providers, joint ventures being a important tool to complement the inside resources if necessary. An examination of the databases for patent applications for modules support this argument. It shows that all companies, independently of their type, fill-in patent applications for the total redesign of the module – even where some lack the skill to put the patented technology into production. This policy could be viewed as a way of blocking the road to competitors, forcing negotiations that will occasionally end up as joint-venture agreements, with one party providing the patent, the other the competence needed to develop the patented technology – the dual strategy is thus played out to the full.

Up to now, some evidences shows that this dual model is on its way to structure the on going development of leaders in the automotive suppliers business. An example is the new 2010 plan of a main component specialist, Valéo, presented in February 2004 the firm with a new dual structuration: component business units and global solution provider on large domain as power train efficiency. Another is the latest joint venture announced at the same time by Plastic Omnium and Hella-Behr, two companies that have decided to pool their competence to create a new player associating a product-oriented firm and a component specialist.

The research is now on its way to analyse the implementation of such strategic turns within automotive supply chain.

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